

## Short Note

# Visual determination of sex in live Pacific halibut

Gilbert St-Pierre

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A procedure to determine the sex of live Pacific halibut is fast, accurate and consists of visually examining the shape of the genital vent. The procedure was tested on 1708 live halibut with an accuracy rate of 98%. The procedure is effective for halibut 52 cm or longer but unsuitable for halibut under that length because the bulk of the genital vent is inadequate to evaluate with the naked eye. This procedure aids in population assessment and is valuable in establishing the sex of tagged fish and brood stock in halibut rearing programmes.

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G. St-Pierre: International Pacific Halibut Commission, P.O. Box 95009, Seattle, Washington 98145-2009, USA.

Positive sexual determination of live Pacific halibut (*Hippoglossus stenolepis*) was possible in the past only through the observation of natural or forced discharge of sexual products from mature individuals throughout the spawning season. Nevertheless, it was impossible to determine the sex of many mature individuals by this method because the ripening of sexual products varies between individuals and because the spawning season for Pacific halibut is protracted, extending from early November to the end of March (St-Pierre, 1984). However, males ripen as early as August and many are often found extruding milt for a few months after females have finished spawning. At other times of the year it was simply impossible to differentiate the sex of live halibut with any degree of certainty.

Until recently it was mandatory to cut open the fish to determine its sex because the walls of the body cavity for halibut are too thick and opaque for external examination of gonads and no secondary sexual characteristics had been identified aside from the difference in size between the sexes. Almost all halibut over 45 kg are females, whereas male halibut seldom reach that weight (IPHC, 1987).

Prior knowledge of the sex of a tagged fish is useful in estimating growth rates, mortality rates and migration patterns in halibut by sex (Trumble *et al.*, 1990). Sex determination during tagging is preferable since this information is obtained from only 20% of recaptured halibut. Furthermore, the usefulness of the tagging data is reduced

due to inadequate and improper recording of sex information by the finders so that sex information is often rejected as being presumably inaccurate. Sex information associated with the portion of the catch released alive during research cruises will be useful in population assessment. Prior knowledge of the sex composition of brood stock will also be advantageous in live halibut rearing projects.

A procedure to determine the sex of live halibut was developed during recent International Pacific Halibut Commission (IPHC) tagging cruises. A sex determination strategy was initiated in late May 1988, when dissimilar physical structures were observed on halibut 65 cm or greater in length caught by hook and line. A few males were found still extruding small amounts of milt and an attempt was made to identify males by examining the genital vents which were swollen in appearance and often differed markedly in general shape when compared to other halibut. A strategy evolved whereby individuals whose genital vent resembled the vent configuration exhibited by males found extruding milt were mentally classified as probable males. The others were classified as likely females. Then, each halibut unsuitable for tagging was first classified as to its sex and immediately eviscerated for positive identification.

The sex determination procedure proved to be fundamentally correct. By trial and error the accuracy increased proportionately to the number of halibut examined. The procedure developed is fast, accurate and consists of an

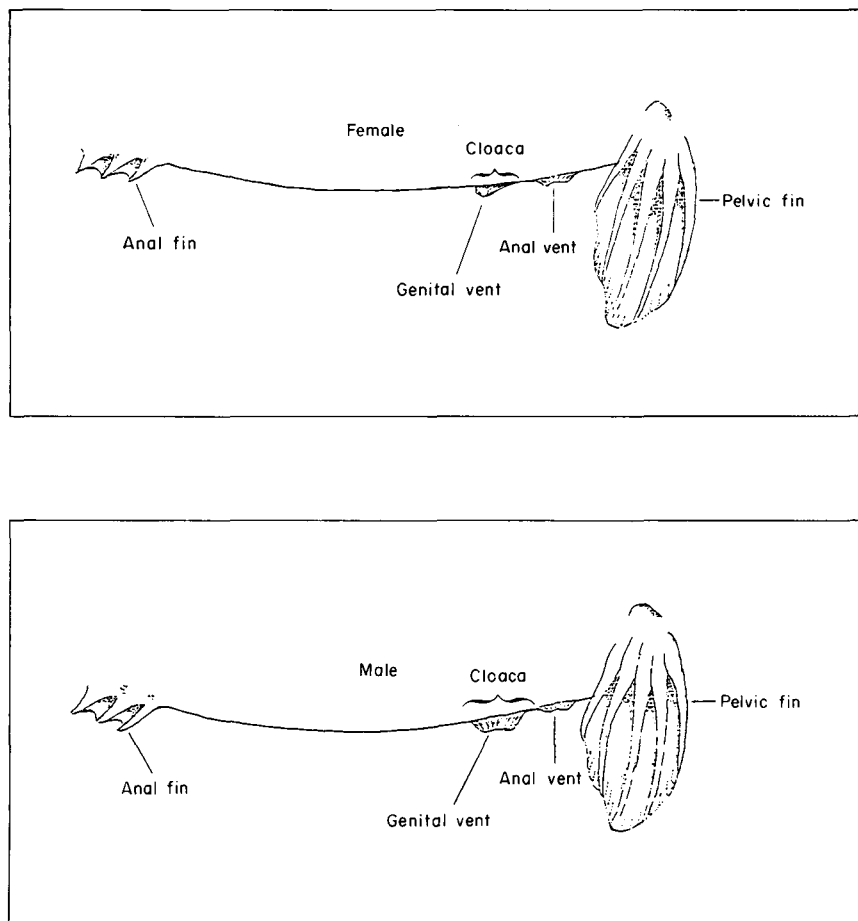


Figure 1. Lateral view of female and male genital vents in Pacific halibut.

external visual examination of the shape of the genital vent. The genital vent is located behind the anal vent, both of which are situated directly behind the pelvic fins and anterior to the anal fin (Figs 1 and 2). The pore of the generative duct and the pore of the urinary duct are enclosed by the cloaca. The cloaca on female halibut appears as a small cone-shaped projection, similar in profile to a bud on a plant or a small nipple, with the vent or terminal end oriented at a marked angle towards the anal fin. The cloaca of an immature or maturing (prior to first spawning) female is small in mass, with the genital vent appearing tightly closed. Conversely, the cloaca of a mature female is bulkier in mass or swollen in appearance and the opening of the genital vent is larger in size and relaxed in appearance. In male halibut, the cloaca is also cone-shaped, but with the vent end truncated, giving it a blunt appearance not observed in the female. In addition, the opening of the cloaca is oriented nearly perpendicular to the body with the vent opening much larger in size than in female halibut. The urinary and generative duct pores in many mature males are often visible at the surface interface of the vent opening.

During the first cruise in June 1988, the sex of 101 out of 102 setline-caught commercial size halibut ( $> 81$  cm) was correctly predicted by the author. On a later cruise in September of that same year, 845 setline-caught halibut over 81 cm were sexed with a 97% success rate by two International Pacific Halibut Commission biologists using the same procedure. In June 1989, 761 setline-caught halibut, 56 cm in length and over, were classified by the author with a 99% accuracy rate. No sex- or size-related bias was detected in these results, except that the level of accuracy increases proportionally with the number of halibut examined.

All inspections of the genital vent were achieved unaided by any optical device. The sex determination of about 10% of the individuals studied has required more than casual visual observation because of the presence of scar-like tissue and/or the deflated or deformed appearance of the cloaca in some larger individuals of both sexes. This difficulty is usually resolved by massaging the bladder area in a lingering movement directed towards the genital vent in order to expel urine or body fluids. If successful, the form of the originally deflated or deformed genital vent

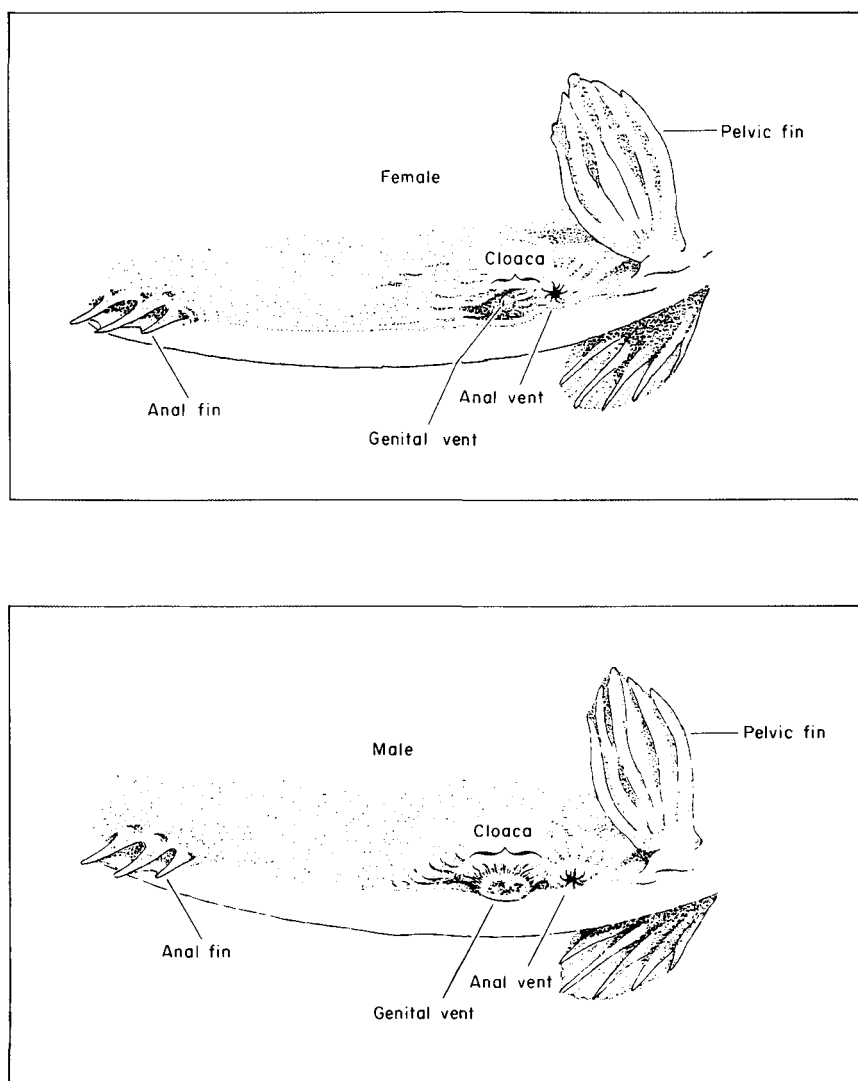


Figure 2. Ventral view of female and male genital vents in Pacific halibut.

becomes easily recognizable for one or two seconds as a small quantity of body fluids is being expelled. Unfortunately, this sex determination procedure is not applicable to halibut landed commercially as the genital vent is usually cut through or scraped off during evisceration of the fish.

Trawl-caught halibut were examined by the author during the summer of 1990 to investigate whether the present sex determination procedure is applicable to smaller individuals. The length composition of the trawl-caught halibut was made up mostly of smaller individuals ranging in length from 30 to 65 cm. The inspection is easy for individuals measuring over 60 cm in length but becomes increasingly more difficult for those measuring between 60 cm and 45 cm and is seldom possible for those under 45 cm. The reason is that the bulk of the genital vent

decreases proportionally with the dimensions of the fish. It is unknown whether the cloaca in smaller individuals changes shape as fish size increases or as maturity approaches. In general, the accuracy diminishes rapidly in halibut measuring between 60 cm and 45 cm in length. Although the procedure is suitable for some halibut in the 45–52 cm size range, the size of the genital vent is often inadequate for accurate visual sex determination. The procedure appears practical for halibut 52 cm or longer.

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## References

- IPHC (International Pacific Halibut Commission). 1987. The Pacific halibut: biology, fishery, and management. International Pacific Commission Technical Report, 22: 59p.
- St-Pierre, G. 1984. Spawning locations and season for Pacific halibut. International Pacific Halibut Commission Scientific Report, 70: 46p.
- Trumble, R. J., McGregor, I. R., St-Pierre, G., McCaughran, D. A., and S. H. Hoag. 1990. Sixty years of tagging Pacific halibut: a case study. American Fisheries Society Symposium, 7: 831–840.